

LETTER REPORT
Capability Based Resourcing for DPEM
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BACKGROUND: Depot Purchased Equipment Maintenance (DPEM) is a process that determines, coordinates, funds, and executes maintenance requirements for DPEM assets between the customers (MAJCOMs) and the suppliers (Air Logistics Centers). DPEM assets consist of eight commodity groups: Aircraft; Engines; Software; Exchangeables; Other Major End Items (OMEI); Area Support, Base Support, Local Manufacture (A/B/M); Missiles; and Storage. MAJCOM requirements for each of the commodities are determined from the present FY through the years covered in the next PBR cycle.

As a whole, DPEM is funded at approximately 80%; therefore, some requirements are unfunded in the budget process. The funding impacts are stated in terms of deferrals with emphasis placed on the number of Programmed Depot Maintenance (PDM) and whole-engine overhaul deferrals. Projected requirements and funding are adjusted until the execution year, in which MAJCOMs actually fund and execute their requirements. Although MAJCOMs generally fund requirements as budgeted, MAJCOMs control their funding allocations and have the flexibility to reallocate based on changing needs and priorities. At the execution year's conclusion, the actual deferrals realized typically vary significantly from those projected, with the two most salient deferrals, PDMs and whole-engine overhauls, being lower than projected.

The focus placed on PDM and whole-engine overhaul deferrals detracts from the potential impacts to the other DPEM commodities as well to aircraft that do not undergo PDMs and engines overhauled in modules. With the advent of Centralized Asset Management (CAM), funding allocations will be centrally controlled, so it is critical to effectively project and assess the impacts of deferrals across the entire spectrum of DPEM.

Purpose of Report: This study was terminated at the sponsor's request prior to completion. The purpose of this letter report is to support any future review of DPEM policies and processes by documenting and communicating the information gathered during our study. As such, this report provides background information, discussion of our approach and methodology, tentative conclusions, and implications for further study, including some alternative approaches which could be taken.

PROBLEM STATEMENT: Historically, the AF Depot Purchased Equipment Maintenance (DPEM) requirements development and validation process projects the impacts of funding and shortfalls/deferrals for the DPEM budget. This study seeks to determine why projected deferrals in budget years vary from actuals in execution years for all eight DPEM commodities. Determining causes of deferral variances will enable

effective implementation of CAM by understanding the factors affecting each commodity and the interplay between them.

OBJECTIVE(S): This study seeks to:

1. Determine causes of deferral variances for all eight DPEM commodities
2. Examine the CAM ramifications of deferral variance causes

METHODOLOGY: Deferrals must be viewed both in terms of their underlying commodity group and generating MAJCOM. The properties of the commodity groups vary widely both in terms of how their requirements are projected and their reliability of generation in the execution year. Furthermore, each MAJCOM has a different prioritization and funding strategy for its commodity groups. Therefore, the analysis was conducted on a MAJCOM-by-MAJCOM basis. Throughout the analysis, it was assumed that MAJCOMs act independently of each other in the execution year.

The analysis was conducted by first identifying the deferral variances, then determining their causes. To identify variances, data from the DPEM database was attained from AFMC for FY04-FY06 execution years and associated Program Objective Memorandum (POM) years. (***Implication for further study:** President's Budget position may be better comparison point than DPEM data.*) The data contained for each year (in terms of both individual items and dollars): (1) Projected/actual deferrals and (2) Projected/actual Logistic Support Review (LSR) requirements and funding levels. The data was resolved down to the MAJCOM and subcommodity level. Prior to receipt of the data, a criterion was established that a deferral varying from its projection by more than 10% would be considered significant. The intent of this criterion was to streamline the analysis such that only substantial variances would be considered. (***Implication for further study:** An alternative methodology would be to review all variances. Almost all variances were greater than 10%; therefore, the 10% threshold had very minimal impact and did not significantly reduce study effort.*)

Several hypotheses were considered for causes of variances. These include:

1. Deferral variances are caused by MAJCOMs reprioritizing funding in the execution year.
2. Deferral variances are caused by variations/inaccuracies in the computation of LSR requirements and/or MAJCOM funding projections.
3. Deferral variances are caused by funding reallocations in response to unanticipated events.
4. Deferral variances are caused by MAJCOMs having more or less DPEM funds through additional or competing funding.

(***Implication for further study:** An additional hypothesis would be: "Deferral variances are caused by engineering waivers/condition assessments."*)

The first hypothesis concerns MAJCOM funding reallocations in which a MAJCOM budgets differently than it intends or expects to execute. For example a MAJCOM may fund a worst case scenario even though it is expected not to generate. Also, in the case of engines, some MAJCOMs have the capability to perform three-level maintenance at their bases. Because some engines could be repaired at base level, fewer engines than projected might require DPEM funds for maintenance. Instead, base level module maintenance and overhaul would utilize flying hour funding. In other words, the difference between module maintenance and overhaul would be a trade off in using Flying Hour funding vs. DPEM funding.

The second hypothesis addresses variances caused due to inaccurate requirements or funding projections. An asset may generate more or less than expected, and MAJCOMs base their funding on projected LSR prices, inflation and occurrence factors. The third hypothesis recognizes the possibility that sometimes MAJCOMs are forced to reallocate funds in response to external events outside the scope of DPEM projections. Such events will affect deferrals either directly (inability to execute) or indirectly (causing movements of funding). The final hypothesis accounts for funds entering or exiting a MAJCOM's DPEM fund. For example, GWOT (Global War on Terrorism) funds are often received by MAJCOMs in addition to their budgeted DPEM funds.

To prove or disprove each hypothesis, a combination of anecdotal and analytical approaches were taken. As mentioned earlier, the DPEM database provides each MAJCOM's planned and actual execution of each commodity, making it possible to observe deviations from planned funding. However, this by itself is inconclusive because the MAJCOM could have altered execution year funding due to any of the four hypotheses. To bracket an exact cause, it is necessary to either collect more data, pursuing an analytical approach, or engage MAJCOM corporate knowledge. Due to time constraints, insufficiency of data, and the large number of significant variances, MAJCOMs were queried as to the causes of specific variances.

Data from the DPEM database for FY05 and FY06 execution and associated POM years was separated by MAJCOM, and deferral variances for each overall commodity and subcommodity were computed. (***Implication for further study:** President's Budget position may be better comparison point than POM data.*) Also computed were the associated planned and actual funding levels for each respective category. The datasets were delivered to MAJCOM A4 POCs with instructions to identify the causes of significant variances in each commodity.

RESEARCH AND FINDINGS: This section discusses the analysis of each study objective in turn. First discussed is analysis of deferrals, then their ramifications for CAM.

Deferral Variance Causes

A preliminary analysis of the DPEM data indicated a prevalence of significant deferral variances—those varying from their projections by more than 10%. (***Implication for***

further study: Alternative methodology would be to review all variances. Almost all variances were greater than 10%; therefore, the 10% threshold had very minimal impact and did not significantly reduce study effort.) Significant deferral variances were observed for aggregate commodities at the AF-level, and generally the variances increased at the MAJCOM and subcommodity levels. This made it impossible to streamline the analysis by focusing on a subset of each MAJCOM's assets. Further complicating the analysis was the omission of key deferral data. Deferrals were reported both in terms of whole units and funding; however, the quantity of actual whole-engine deferrals was omitted in the execution years. (**Implication for further study:** *The absence of complete data in the DPEM database will necessitate alternative data sources. For example, were there comparable increases in flying hour costs?*) Consequently, in cases where the execution-year LSR requirement for engine overhauls was under-funded (indicating a deferral), it is impossible to determine from the database alone whether fewer engines generated than expected or engines were actually deferred. This information had to be obtained directly from the MAJCOMs.

The database also provided planned and actual funding levels for each MAJCOM's DPEM assets. Like deferrals, the planned funding levels of DPEM commodities typically differed greatly from the levels realized in the execution year. Furthermore, there was no indication that funding projections were better for POMs closer to the execution year than those further away. Since the LSR requirements, their associated funding, and the total funding available to each MAJCOM varied, it was not possible to partition the variations into clear trends of funding movements. Therefore, evidence of deliberate funding reallocations could not be obtained from the DPEM data alone.

To summarize, the DPEM database is useful to identify deferrals (with the exception of engine overhauls); however, it does not indicate why the deferrals occurred. Due to time constraints, this information was acquired by directly querying the MAJCOMs as to the causes of their deferrals. Seven MAJCOMs (ACC, AETC, AFRC, AFSOC, AFSPC, ANG, and PACAF) responded before research was terminated; AMC and AFMC were informally interviewed. The detail of MAJCOM responses was relatively low—primarily because the MAJCOMs do not systematically track and store execution-year decision data. MAJCOMs can generally identify the causes of PDM and engine overhaul deferrals because these are highly visible; however, virtually no information is retained regarding the other commodities. No MAJCOM could identify a rigorous, quantitative methodology for planning and allocating funding. Each MAJCOM has nuances with regards to DPEM execution; however, MAJCOMs can be classified into two main groups. Flying-intensive MAJCOMs (ACC, AETC, AFRC, AFSOC, ANG, PACAF and USAFE) allocate significant DPEM funds to aircraft and engines. Non flying-intensive MAJCOMs (AFMC and AFSPC) do not possess significant aircraft or engine assets, and at the termination of research, their funding strategies could not be sufficiently characterized.

Flying-intensive MAJCOMs generally prioritize PDMs first and engine overhauls second. In the execution year, funding is adjusted as necessary to minimize PDM and engine overhaul deferrals. Remaining funding is distributed among software, OMEI,

exchangeables, and A/B/M commodities based on the relative priorities of items in each group. Missiles (ACC only) and storage are minor commodities and typically receive full funding. Actual PDM and engine overhaul deferrals are generally much less than projected by each MAJCOM. The MAJCOMs acknowledge this; however, each attributes different reasons. For example ACC perceives its ability to eliminate deferrals is through the reallocation of money freed due to requirements generating less than projected (particularly engines) whereas AMC perceived GWOT funding as key to eliminating its deferrals.

Evidence was found supporting all four hypotheses, and no one hypothesis appeared to dominate the others. The following is a summary of the findings with regards to each hypothesis.

1. Deferral variances are caused by MAJCOMs reprioritizing funding in the execution year.

Some MAJCOMs have reported that they budget differently than they intend to execute. The analysis did not find any evidence of extensive gamesmanship; however, there are some areas that deserve attention.

- AFRC reported budgeting PDMs at the expense of unscheduled depot level maintenance (UDLMs), which are almost certain to generate. In the execution year, PDMs are unfunded to cover the UDLMs. An attempt is made to reallocate funding to cover the PDMs. (**Implication for further study:** *Quantify the extent to which unbudgeted UDLMs affect DPEM funds.*)
- Most MAJCOMs have three-level maintenance capabilities for one or more of their engine types. This is significant because engines that generate and are overhauled at the base (in lieu of sending them to the depot) are funded with depot level repairable (DLR) or material support division (MSD) funds. Unlike DPEM, DLR and MSD receive more reliable funding. Therefore, engine funding can be reallocated to other requirements. Although some MAJCOMs acknowledged three-level maintenance capabilities, no MAJCOM had data readily available to indicate its degree. (**Implication for further study:** *Additional review of DPEM funding allocations and execution as compared to flying hour funding allocations and execution may provide more insight.*)

2. Deferral variances are caused by variations/inaccuracies in the computation of LSR requirements and/or MAJCOM funding projections.

This is perhaps the most difficult hypothesis to rigorously confirm due to the interplay between requirements projection, generation and LSR prices. However, there is evidence that deferrals are impacted, in part, by inaccurate projections. Requirements in general may be overestimated to create a safety margin.

- ACC reported that it typically expects engines to generate less than projected. In FY05, 480 overhauls were projected, and 416 were executed. In FY06, 466 were

projected, and 393 were executed. ACC reported zero deferrals, and stated that three-level maintenance did not play a significant role in the less-than-projected generation. **(Implication for further study:** *Further review is needed—including determination if there was a higher cost per flying hour increase if more modules were input in lieu of whole engines. If not, then need to perform further review of factors such as fighter engine usage cycles (TACs) per flying hour, the way engines were flown, flight profiles, etc. Consistent overprojection of these factors could drive higher requirement projections than what actually generate.)*

- Commodities such as software, OMEI, exchangeables, and A/B/M are inherently difficult to predict. Although MAJCOMs budget to execute specific requirements, the money is really just spread over the requirements which are then executed ad hoc by relative priority.

3. *Deferral variances are caused by funding reallocations in response to unanticipated events.*

Several MAJCOMs were affected by events outside the scope of DPEM projections. No MAJCOMs reported deferrals caused by depot capacity constraints.

- ANG reported tornado damage that destroyed 1 C-130 and damaged several others in FY05. A \$25M supplement was received.
- MAJCOMs with C-130s have incurred substantial PDM expenses since FY04 (\$9M per aircraft) to replace the center wing boxes on aged aircraft after metal fatigue was uncovered. Nearly 100 aircraft were affected. **(Implication for further study:** *Although this was reported as an explanation for variance by some MAJCOMS, it may not be relevant. Further study is needed to determine whether this situation resulted in generation of unscheduled depot level maintenance which added requirements to an already constrained budget. Another possibility is that this modification may have been funded with procurement funds instead of DPEM funds.)*

4. *Deferral variances are caused by MAJCOMs having more or less DPEM funds through additional or competing funding.*

Not all MAJCOMs reported significant deferral variances due to supplementary or competing funding. Some MAJCOMs identified flows to and from their DPEM funds as the primary cause of deferral variances.

- AMC identified GWOT funding as the primary factor eliminating PDM deferrals. In 2005, AMC received GWOT funding for 8 KC-135 PDMs. In 2006, AMC received GWOT funding for 2 C-130 PDMs, 29 C-130 center wing box replacements, and (combined with AETC) 8 KC-135 PDMs. **(Implication for further study:** *Additional review of this area is needed to gauge the effect of GWOT funding being applied against existing requirements vice restricting the funding to only GWOT-generated requirements. If GWOT was used only*

for GWOT caused events, then the PDM deferrals would probably have occurred. The OSD allowed the Air Force to use the rationale that GWOT readiness and capability would be severely impacted by airlift which would be grounded due to overdue PDMs. Thus, the Air Force was allowed to use GWOT funding against requirements which would have generated regardless of peace time or GWOT related activities.)

- ANG is unique in that it uses an Operations and Maintenance (3840) fund for DPEM. In addition to depot maintenance, this fund covers aircraft operations and a wide variety of other support operations. In FY05 and FY06, the price of aircraft fuel, a commodity covered by the 3040 fund, increased. This led to an unspecified number of KC-135, C-130, and F-15 PDM deferrals as well as KC-135 and F-15 engine deferrals. ***(Implication for further study: Is this happening only in ANG? Did ANG and other components receive fuel readjustments in their flying hour execution programs? What is the impact of the fuel readjustments on DPEM deferrals?)***
- AFRC assets are used to fly missions for AMC. In turn, AFRC receives Transportation Working Capital funds (analogous to GWOT) from AMC. This funding offsets potential PDM deferrals. ***(Implication for further study: Quantify the amount to determine relative impact of this funding. Determine if management via lead command fleet support shifts the cost/ burden to all users rather than eliminating/delaying workload AFRC.)***
- AFRC has persistently removed funding from its Sustaining Engineering Program to eliminate PDM deferrals. This was highlighted by AFRC as a cause of future concern.

CAM Ramifications

CAM may eliminate or reduce variances. CAM will enable decisions with a global or fleet perspective rather than parochial MAJCOM viewpoints. The possible effect of CAM on each hypothesis is discussed in turn.

Hypothesis: Deferral variances are caused by MAJCOMs reprioritizing funding in the execution year.

CAM Ramification: As MAJCOMs will no longer control funding, this source of deferral variance may be completely eliminated. A corollary situation will be that deferral variance may still occur, but will be due to reprioritization of funding at the enterprise level.

Hypothesis: Deferral variances are caused by variations/inaccuracies in the computation of LSR requirements and/or MAJCOM funding projections.

CAM Ramification: CAM will still rely on requirement projections which will always have associated error; however, this error may be reduced by aggregating assets at the enterprise-level. Instead of an asset's requirements and funding levels being projected

separately over multiple MAJCOMs—each having potential errors, one requirement and funding projection will be generated for each class of asset.

Requirements such as software, OMEI, exchangeables, and A/B/M are inherently difficult and unreliable to predict. They are neither scheduled, like PDMs, nor do they have a rigorous calculation methodology, like engines. However, year-to-year variation of total AF spending on each commodity for FY04-FY06 varied by less than 16%. This suggests that these commodities can be more easily managed via a top-down approach in which aggregate AF funding for each commodity is projected and the items in each commodity are executed on a priority basis. Projections for specific items would only be required when necessary for depot capacity planning purposes.

Hypothesis: Deferral variances are caused by funding reallocations in response to unanticipated events.

CAM Ramification: Unanticipated events may continue to cause deferral variances. However, for events that affect AF-wide assets (such as the C-130 center-wing box), CAM enables the possibility of a standardized plan to manage the most critical deferrals from the enterprise perspective.

Hypothesis: Deferral variances are caused by MAJCOMs having more or less DPEM funds through additional or competing funding.

CAM Ramification: MAJCOMs currently rely on supplementary funding to prevent critical PDM and engine deferrals. While there appears to be some anecdotal evidence of overstated requirements, it is doubtful that this funding is not, at least in part, needed to avoid deferrals. Additional funds will likely still be required under CAM; however, the requests can be both better coordinated and projected at the AF-level. Avoided is the unpredictability of each MAJCOM acting as a separate and possible competing, funding requester.

CONCLUSIONS AND RECOMMENDATIONS:

Tentative Conclusions:

1. Deferral variances are caused, in part, by each of the four hypotheses. (***Implication for further study:** Consider additional hypotheses.*)
2. CAM may eliminate or reduce some variances. CAM will enable decisions with a global or fleet perspective rather than parochial MAJCOM viewpoints.

Recommendation:

When implementing CAM, rigorously and systematically collect data on actual deferrals as well as funding adjustments and their associated rationale.

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